a' cncld.

excitation step S1, that is, the b-side of the exciting coil 1a2 becomes a non-excited state and the exciting coil 1a2 becomes the S pole, the N pole of the rotor 1b is attracted toward the a-side of the exciting coil 1a1, and the rotor 1b becomes stable.

Please replace the paragraph beginning at page 2, line 15 with the following rewritten paragraph:

a 2, cnt.

When the excitation state of excitation step S8 is generated again from excitation step S1, the rotor 1b rotates again by 9 degrees in the arrow Y1 direction and becomes stable. Like the above, the rotor 1b turns by 9 degrees every step in the arrow Y1 direction by repeatedly controlling the excitation state of the exciting coils 1a1, 1a2 according to the excitation pattern consisting of the excitation steps S8 to S1.

Please replace the paragraph beginning at page 2, line 21 with the following rewritten paragraph:

In order to rotate the rotor 1b in an arrow Y2 direction, the excitation state of the exciting coils 1a1, 1a2 is controlled according to a pattern opposite the above excitation pattern, i.e., from S1 toward S8, whereby the pointer 2 shifts in an arrow Y4 direction (FIG. 5).

Please replace the paragraph beginning at page 2, line 25 with the following rewritten paragraph:

Next, an operation of the above indicating apparatus used for a vehicle-speedometer, for

a2 cmdd.

example, is described hereinafter. An angle data D1 is supplied to the drive controller 4, which angle data D1 shows a rotation angle of the rotor 1b corresponding to a travel which is a difference between a target position of the pointer 2 and a present position thereof. The target position of the pointer 2 is calculated on the basis of speed information from a speed sensor. By means of the drive controller 4 controlling an excitation state of the exciting coils 1a1, 1a2 according to this angle data D1, the pointer 2 shifts by only the above travel and indicates the target position.

Please replace the paragraph beginning at page 3, line 9 with the following rewritten paragraph:

With respect to the above indicating apparatus, however, a power swing caused by an input of the angle data D1 affected by vibration and noise of the vehicle body could be brought about, wherein an actual travel of the pointer 2 differs from the target travel of the pointer 2. If the power swing is repeated, a difference arises between the speed indicated by the pointer 2 and the speed information from the speed sensor, whereby the indicating apparatus can not carry out an accurate indication.

Please replace the paragraph beginning at page 4, line 6 with the following rewritten paragraph:

a3 cmt.

Because the excitation state of the exciting coils 1a1, 1a2 is continuously controlled even though the pointer 2 has fully returned to the stopper 5, the pointer 2 repeats abutting and leaving the stopper 5, thereby making an unpleasant clattering noise.

Please replace the paragraph beginning at page 4, line 10 with the following rewritten paragraph:

a3 cncld.

In order to solve the above problem, the indicating apparatus which closes the reset operation simultaneously with the abutment of the pointer 2 against the stopper 5 is proposed. That is, because an induction voltage is generated in the exciting coil 1a1 or 1a2 being in a no-excited state while the pointer 2 is not in contact with the stopper 5 and therefore the rotor 1b is moving, and, on the other hand, because an induction voltage is not generated in the exciting coil being in a non-excited state while the pointer 2 is in contact with the stopper 5 and, therefore, the rotor 1b is stopping, the voltage generated in either, being in the non-excited state, of the exciting coils can be detected at a timing of the exciting coil being controlled into the non-excited state.

Please replace the paragraph beginning at page 4, line 20 with the following rewritten paragraph:

Whether or not the induction voltage has been generated is judged, and if yes, movement of the pointer 2 is stopped on a judgment that the pointer 2 has abutted the stopper 5.

Please replace the paragraph beginning at page 4, line 25 with the following rewritten paragraph:

a4

The rotor 1b is continuously controlled to reverse in the state that the pointer 2 is in contact with the stopper 5, the rotor 1b sometimes normally rotates at a timing of the exciting coils 1a1, 1a2 being changed to the proper excited states.

Please replace the paragraph beginning at page 6, line 7 with the following rewritten paragraph:

a5

According to the present invention with the first aspect, because the detecting coil is provided in addition to the exciting coils, the presence or absence of induction voltage generated in the detecting coil can be detected at each excitation step. Therefore, because whether or not the rotor is turning or stopping can be judged, the abutment of the driven member against the stopper can be securely detected.

Please replace the paragraph beginning at page 6, line 16 with the following rewritten paragraph:

a6

According to the present invention with the second aspect, because the detecting coil is provided at a center of a longest peripheral surface between adjoining exciting coils, the detecting coil can be prevented from receiving an influence from the excitation state of the exciting coils, thereby further securely ensuring detection of the abutment of the driven member against the stopper.

Please replace the paragraph beginning at page 7, line 14 with the following rewritten paragraph:

a7

According to the present invention with the third aspect, in the stepping motor, the rotor provided with a plurality of N/S poles rotates following a change of an excitation state of the exciting coils, and the detecting coil provided separately from the exciting coils generates an induction voltage according to rotating of the rotor. The stopper mechanically stops the driven member at a

predetermined position. In addition, the first exciting means normally or reversely rotates the rotor by controlling the excitation state of the exciting coils. Further, the second exciting means reverses the rotor in a direction of making the driven member move toward the predetermined position by controlling the excitation state of the exciting coils.

a7 cont.

Please replace the paragraph beginning at page 7, line 23 with the following rewritten paragraph:

The position detecting means detects the driven member having abutted the stopper and stopped at the predetermined position on a basis of induction voltage generated in the detecting coil during control by the second exciting means. The controlling means stops the first exciting means controlling and starts the second exciting means controlling when an instruction signal is inputted, and also starts the first exciting means controlling and stops the second exciting means controlling when the position detecting means detects the driven member having stopped at the predetermined position.

Please replace the paragraph beginning at page 8, line 6 with the following rewritten paragraph:

Therefore, because the detecting coil is provided in addition to the exciting coils, the presence or absence of an induction voltage generated in the detecting coil can be detected at each excitation stop. Therefore, because whether or not the rotor is turning or stopping can be judged, the abutment of the driven member against the stopper can be securely detected in the driving

a7 cmd'd.

apparatus.

Please replace the paragraph beginning at page 8, line 16 with the following rewritten paragraph:

a8

FIG. 1 is a diagram showing an embodiment of a stopping motor of the present invention;

FIG. 2 is a diagram showing an indicating apparatus as a driving apparatus in which the stepping motor of FIG. 1 is mounted;

FIG. 3 is a circuit diagram showing a drive controller of the indicating apparatus of FIG. 2;

FIG. 4 is a timing chart of excitation pulses outputted from a second excitation circuit of FIG. 3;

FIG. 5 is a diagram showing a prior art indicating apparatus as the driving apparatus in which a conventional stepping motor is mounted; and

FIGS. 6A-6H are diagrams each showing a relation between an excitation state of the exciting coils and rotation of the rotor.

Please replace the paragraph beginning at page 9, line 7 with the following rewritten paragraph:

a9 cmt.

FIG. 1 is a diagram showing an embodiment of a stepping motor fo the present invention. The stepping motor 1 has exciting coils 1a1, 1a2 wound upon a stator 1d, a rotor 1b on which five sets of N/S poles are magnetized in turn and which rotates following a change of an excitation state of the exciting coils 1a1, 1a2, and detecting coil 1c in which induction voltage is generated according

a9 cmd'd.

to rotation of the rotor 1b.

Please replace the paragraph beginning at page 10, line 1 with the following rewritten paragraph:

a10

As shown in FIG. 4, the above excitation pulses P11-P14 have different phases from each other so that the rotor 1b can turn by 9 degrees per one step. By inputting the excitation pulses P11-P14 to the a-side and the b-side of the exciting coil 1a2 and to the b-side and the a-side of the exciting coil 1a1, the excitation state of the exciting coils 1a1, 1a2 changes correspondingly to excitation steps S8 to S1 as shown in FIG. 4, and the rotor 1b reverses following the change of the excitation state.

Please replace the paragraph beginning at page 10, line 15 with the following rewritten paragraph:

a11

The drive controller 4 further has a control circuit 4e (a controlling means), which stops the control by the first excitation circuit 4a when an instruction signal S3 outputted at the timing of the ignition ON/OFF, the connection with the vehicle-mounted battery, or the like, is inputted and starts the control by the second excitation circuit 4b, and which starts the control by the first excitation circuit 4a when the position detection circuit 4d detects the stopping of the pointer 2 at the zero position with abutting the stopper 5 and stops the control by the second excitation circuit 4b.

Please replace the paragraph beginning at page 11, line 4 with the following rewritten

paragraph:

a12 The control circuit 4e makes the second excitation circuit 4b output the excitation pulses P11-P14 to start the control of the exciting coils 1a1, 1a2. When the excitation pulses P11-P14 are inputted, the exciting coils 1a1, 1a2 are excited according to excitation steps shown in FIG. 4, whereby the rotor 1b reverses every 9 degrees. The pointer 2 is shifted toward the stopper 5.

Please replace the paragraph beginning at page 11, line 18 with the following rewritten paragraph:

a13 The control circuit 4e stops outputting the rejection signal according to this detection signal, whereby the control by the first excitation circuit 4a is started, the output of the excitation pulses P11-P14 from the second excitation circuit 4b is stopped, and the control by the second excitation circuit 4b is stopped, thereby stopping the reset operation.

Please replace the paragraph beginning at page 12, line 3 with the following rewritten paragraph:

a14 As shown in FIG. 1, the exciting coils 1a1, 1a2 are provided along the peripheral surface of the rotor 1b at an angle of 90 degrees (not shown) to each other. The detecting coil 1c is provided along the longer peripheral surface between the exciting coils 1a1, 1a2 at the center thereof.

Please replace the paragraph beginning at page 12, line 7 with the following rewritten paragraph: